Applicator apparatus of a shoe cover

DESCRIPTION

Field of the invention

The present invention generally relates to the field of apparatuses used for applying disposable covering garments.

The invention refers, more specifically, to an applicator apparatus of a shoe cover that has a preferred, although not exclusive, use for applying a disposable covering garment on a footwear worn by a user.

In the following the description and in the subsequent claims, such a covering garment will be indicated with the term: shoe cover.

Prior art

Disposable covering garments, such as for example caps, capes and, indeed, shoe covers have been used ever since to reduce to a minimum the possibility of contaminating aseptic areas, such as for example the operating rooms of a hospital, or the so-called "clean rooms" present in those laboratories where it is necessary to maintain a very low level of dust, dirt and contaminants.

In these areas, disposable covering garments of the footwear have a great importance since the shoes are in constant contact with the aseptic or "clean" areas that needs to be preserved as much as possible from the entry of contaminants.

Traditionally, shoe covers are put on manually by each user with an inevitable handling of the shoe cover which – if not carried out correctly – can frustrate the very purpose which is to be achieved, i.e. that of not introducing contaminants in the aseptic or "clean" area.

The manual application of the shoe cover can also be difficult, with a worsening of the problem of accidental contamination, in the case of elderly or sick people or pregnant women who are usually required to wear suitable shoe covers in hospitals before entering into an operating room. Often, moreover, these "weak" subjects must be helped during the wearing operations by a nurse or trained personnel, with undesired loss of time and use of personnel.

In order to remedy these drawbacks it has thus been proposed to install outside of the

aseptic or "clean" areas an applicator apparatus of a shoe cover capable to avoid the direct manipulation thereof by the user.

A device of this kind is described, for example, in PCT International patent application published under no. WO 02/03823.

The applicator apparatus disclosed in this application comprises a holding arrangement for holding open an insertion opening of the shoe cover adapted to allow the introduction of a footwear at a wearing position and a separation member adapted to separate the shoe cover from the holding arrangement. Both the holding arrangement and the separation member are supported by a base.

The holding arrangement comprises in turn a shaped channel for receiving the shoe cover and the foot of a user, a sliding system of the shoe cover including a pair of shaped guide rods and a holding element of the shoe cover, whereas the separation member preferably comprises a pair of blades arranged at opposite sides of the aforementioned shaped channel to separate the actual shoe cover from a tubular portion adapted to cooperate with the sliding system. An actuator device, for example of the pedal type, is actuated by the user during the wearing operation of the shoe cover so as to deactivate the holding element of the shoe cover and to activate the separation member so as to separate the shoe cover from the tubular portion, which is thrown away, and to be able to remove the footwear with the shoe cover applied.

Although this kind of apparatus allows to avoid the direct manipulation of the shoe cover, the same is however not devoid of drawbacks.

In fact, this apparatus is mechanically complicated and can be subject to jamming in the guided sliding of the shoe cover and/or in the separation thereof from the tubular portion adapted to cooperate with the sliding system.

This apparatus, furthermore, is not only rather expensive, but is also not very versatile, since it requires a substantially single size shoe cover realized *ad hoc* so that it does not lend itself to the application of a shoe cover of a different type and size.

Summary of the invention

The technical problem underlying the present invention is therefore that of providing a device for the application of a disposable covering for a footwear capable of at least partially overcoming the drawbacks illustrated with reference to the cited prior art.

The present invention therefore relates to an applicator apparatus of a shoe cover as defined in the attached claim 1.

More specifically, the applicator apparatus of the invention comprises:

- a supporting frame;
- at least one supporting framework of a shoe cover supported by the frame,

wherein the supporting framework is:

a) shaped so as to hold in a widened condition the insertion opening of the shoe cover peripherally applied thereon; and

b) movably supported by the frame between an upper application position of the shoe cover on the framework and a lower release position of the shoe cover peripherally applied thereon.

Thanks to the aforementioned combination of features, the applicator apparatus of the invention is extremely versatile, mechanically simple, with reliable operation and low cost.

The applicator apparatus of the invention is also advantageously capable of greatly facilitating both the application operations of the shoe cover on the supporting framework, and the release operations of the shoe cover from the framework, i.e. the wearing operations of the shoe cover.

Both these operations, in fact, can be carried out by providing a supporting frame having a suitable height allowing the user to remain in a standing position during the wearing operations.

Advantageously, the application operations of the shoe cover on the supporting framework and the release operations of the shoe cover from the framework can be carried out by the user himself when the use of the shoe cover is required.

Alternatively, the application operations of the shoe cover on the supporting framework can be carried out in advance by trained personnel so as to avoid any manipulation of the shoe cover by the user and therefore substantially remove any possibility of contamination.

In both cases, it is the supporting framework of the shoe cover and not the user or the

trained personnel that moves from the upper application position of the shoe cover to the lower release position thereof (wearing position).

In a particularly preferred embodiment, the supporting framework is angularly movable in the supporting frame between the aforementioned upper and lower positions for the application of the shoe cover and, respectively, for the release of the shoe cover peripherally applied on the framework.

The applicator apparatus of the invention also lends itself quite advantageously to the provision of a "stock" of supporting frameworks, with the corresponding shoe covers ready for use and applied so as to reduce accidental contamination to a minimum, which "stock" is adapted to satisfy the requirements of use for a predetermined period of time, for example for an entire day.

In this case, the applicator apparatus of the invention preferably comprises a plurality of supporting frameworks of the shoe cover each of which is associated to a conveyer device of the frameworks adapted to convey the latter from the application position to the release position of the shoe cover.

Advantageously, the supporting frameworks can be loaded with appropriate shoe covers at predetermined time intervals, for example once a day, with a substantial reduction of the workforce required.

Additional features and advantages of the invention will become more readily apparent from the description of some preferred embodiments of an applicator apparatus according to the invention, given hereinafter for illustrating and not limiting purposes with reference to the attached drawings.

Brief description of the drawings

In such drawings:

- Figure 1 is a perspective view of a first preferred embodiment of the applicator apparatus according to the invention with supporting frameworks of the shoe cover arranged at a lower release position of the shoe cover;

- Figure 2 is a perspective view of the applicator apparatus of figure 1, wherein the supporting frameworks of the shoe cover are arranged at an upper application position of the shoe cover;

- Figure 3 is a perspective view from above of some details of an alternative

embodiment of the applicator apparatus of figure 1, wherein the supporting frameworks of the shoe cover are arranged at a lower release position of the shoe cover;

- Figure 4 is a perspective view of a further preferred embodiment of the applicator apparatus according to the invention;

- Figure 5 is an enlarged perspective view of some details of the applicator apparatus of figure 4, wherein the supporting frameworks of the shoe cover are arranged at a lower release position of the shoe cover;

- Figure 6 is an enlarged perspective view of some details of the applicator apparatus of figure 4, wherein the supporting frameworks of the shoe cover are arranged at an upper application position of the shoe covers;

- Figure 7 is an enlarged perspective view of some details of a conveyer device of a plurality of supporting frameworks of the shoe covers of the applicator apparatus of figure 4;

- Figure 8 is an enlarged perspective view of some details of an alternative embodiment of the applicator apparatus of figure 4, wherein the supporting frameworks of the shoe cover are arranged at a lower release position of the shoe covers;

- Figure 9 is an enlarged perspective view of some details of a further preferred embodiment of the applicator apparatus of figure 4 provided with a raising device of the supporting frameworks of the shoe cover at an upper application position of the shoe covers;

- Figure 10 is a further enlarged perspective view of some details of the raising device of figure 9;

- Figure 11 is an enlarged perspective view of some details of a further preferred embodiment of the applicator apparatus of figure 4 provided with a tilting door at a lower release position of the shoe covers;

- Figure 12 is a further enlarged perspective view of some details of a driving device of the tilting door of the applicator apparatus of figure 11;

- Figure 13 is a schematic view in partial cross section of some details of the driving device of the applicator apparatus of figure 11 in a first operating condition thereof;

- Figure 14 is a schematic view in partial cross section of some details of the driving device of the applicator apparatus of figure 11 in a second operating condition thereof;

- Figures 15 and 16 are schematic views in partial cross section of the driving device and of the tilting door of the applicator apparatus of figure 11 in respective operating conditions thereof.

In figures 1 and 2 a first preferred embodiment of an applicator apparatus of a shoe cover 2 according to the invention is generally indicated at 1.

In a way conventional *per se*, the shoe cover 2 is provided with an insertion opening 3 of a user's footwear, which opening is in this case preferably peripherally provided with an elastic band 4 adapted to close the opening 3 around the user's ankle, or near the same, once the shoe cover 2 has been worn (see figure 1).

The applicator apparatus 1 of this first preferred embodiment advantageously possesses characteristics of extreme structural simplicity and allows both to apply and wear the shoe cover 2 when needed, and to provide a pair of shoe covers 2 ready to be worn on the next occasion, for example when it is desired to avoid that the user manipulates the shoe covers themselves.

The applicator apparatus 1 comprises a supporting frame 5 and at least one supporting framework 6 of the shoe cover 2 movably supported by the frame itself.

In the preferred embodiment illustrated in figures 1 and 2, the applicator apparatus 1 comprises a pair of frameworks 6 supported parallel to each other by the frame 5 preferably in one and the same plane.

Each of the supporting frameworks 6 is shaped so as to hold in a widened condition the insertion opening 3 of the shoe cover 2 once it has been peripherally applied onto the framework 6, as better illustrated in figures 1 and 2.

Preferably, each of the supporting frameworks 6 is substantially ring-shaped so as to facilitate both the widening action of the opening 3 and the insertion operations of the user's footwear.

Each of the supporting frameworks 6 is also movably supported by the frame 5 between an upper application position of the shoe cover 2 on the frameworks 6, illustrated in figure 2, and a lower release position of the shoe cover 2 peripherally applied on the

frameworks 6, or wearing position, illustrated in figure 1.

In the aforementioned application and release positions of the shoe cover 2, moreover, the supporting frameworks 6 define respective planes of application of the shoe cover 2 and of insertion of the user's footwear.

Thanks to this feature and thanks to a suitable positioning of the frameworks 6 on the frame 5 it is advantageously possible to facilitate to the greatest possible extent both the application operations of the shoe cover 2 and the wearing operations by the user.

In this preferred embodiment, each of the supporting frameworks 6 is in particular angularly movable between the upper application position and the lower release position of the shoe cover 2.

Preferably, the application and release positions of the shoe cover 2 and the corresponding planes defined by the frameworks 6 are angularly offset from each other by a predetermined angle α (Fig. 2). Preferably, such an angle α is comprised between 60° and 120°.

Preferably, each of the supporting frameworks 6 of the shoe cover is substantially fork-shaped and comprises a pair of supporting branches 7, 8.

Preferably, at least one of the branches 7, 8 and even more preferably both of the branches, are movable from and towards the second branch of the framework 6, so as to facilitate both the holding action of the shoe cover 2 in the required position and the release operations of the shoe cover in the wearing position.

More specifically and as better illustrated in figure 1, at least one of the branches 7, 8 is movable between an approached position of the branches 7, 8, in which said at least one branch is held by the shoe cover 2 peripherally applied on the framework 6, and a spaced apart position of the branches 7, 8, occupied by said at least one branch once the shoe cover 2 has been released.

In a preferred embodiment of the invention and in order to achieve this desired mobility of the branches 7, 8 of the framework 6, the supporting branches 7, 8 are at least partially made of an elastically deformable material, such as for example a plastics material or a suitable metal having suitable elasticity characteristics.

Within the framework of this preferred embodiment, the supporting branches 7, 8 can be integral with the framework 6 which is made of the aforementioned elastically

deformable material.

In the preferred embodiment illustrated in figures 1 and 2 and again in order to achieve the desired mobility of the branches 7, 8 of the framework 6, the supporting branches 7, 8 are structurally independent from each other so as to be able to be moved independently of each other.

In this case, the branches 7, 8 can, for example, be rotatably articulated to a supporting block 9 by means of respective pins 10, 11, whereas the framework 6 is preferably provided with spring means 13, 14 adapted to urge one or preferably both the branches 7, 8 apart from each other towards the aforementioned spaced apart position.

Advantageously, the spring means 13, 14 contribute to hold in a stable condition the shoe covers 2 peripherally applied on the frameworks 6 and allow, if desired, to use shoe covers 2 having an insertion opening 3 without any elastic band 4.

Preferably, the branches 7, 8 have a curved profile so as to define a supporting framework 6 having the desired preferred substantially ring-shaped configuration.

Preferably, the branches 7, 8 are provided with at least one radially outer edge 12 adapted to engage with the insertion opening 3 of the shoe cover 2.

In the preferred embodiment illustrated in figures 1 and 2, the branches 7, 8 have a substantially C-shaped cross section having opposite wings defining a pair of edges 12. In such a case, the edge 12 adapted to engage with the insertion opening 3 of the shoe cover 2 consists of a lower wing of the aforementioned C (see figure 2).

In the preferred embodiment illustrated in figures 1 and 2, the supporting frame 5 is provided with at least one upright 15, whereas each of the supporting frameworks 6 of the shoe cover 2 can be arranged at the aforementioned application and release positions of the shoe cover 2 angularly offset from each other by means of at least one connection arm 16 angularly movable in a plane substantially perpendicular to the upright 15.

Preferably, the connection arm 16 is fixed to a transversal supporting rod 17 extending substantially perpendicular to the upright 15 (see figure 1).

In this way, the transversal supporting rod 17 is rotatably mounted in the frame 5 about a hinging axis X-X substantially perpendicular to the upright 15.

In the preferred embodiment illustrated in figures 1 and 2, the transversal supporting rod 17 is mounted between a pair of supporting blocks 18, 19 of a movable element 20

rotatably supported by the frame 5. In this preferred configuration of parts, the connection arm 16 is therefore connected to the transversal supporting rod 17 by means of the blocks 18, 19 thus creating a particularly strong structure having a reliable operation.

Preferably, the movable element 20 is provided with at least one counterweight 21, preferably a pair of counterweights associated to the supporting blocks 18, 19, adapted to at least partially balance the weight force applied on the connection arm 16 by the supporting frameworks 6 of the shoe cover 2.

In this way, it is advantageously possible for the user and/or for the trained personnel to move each of the frameworks 6 very regularly and with a minimum effort during the application of the shoe covers 2.

Preferably, the applicator apparatus 1 further comprises a displacing device 22 of each of the supporting frameworks 6 of the shoe cover 2, this device being adapted to arrange the framework 6 at the aforementioned application and release positions of the shoe cover 2 angularly offset from each other.

In the preferred embodiment illustrated in figures 1 and 2, the displacing device 22 comprises at least one lever 23, preferably provided with a handle 24, active on the connection arm 16 of each of the frameworks 6.

Advantageously, the lever 23 is rotatably mounted in the frame 5 about a hinging axis Y-Y substantially parallel to the hinging axis X-X of the transversal supporting rod 17 and, as such, substantially perpendicular to the upright 15 (see figure 1).

In the preferred embodiment illustrated in figures 1 and 2, the lever 23 is kinematically connected to the connection arm 16 by means of an operating rod 25 connected to the transversal supporting rod 17 mounted on the movable element 20.

In this embodiment, the operating rod 25 is rotatably articulated at an upper end to the lever 23 by means of a fork-shaped end 26 and is connected at a lower end to the transversal supporting rod 17 by means of a block 27 centrally fixed to the rod 17 itself.

In the configuration described above, the supporting frameworks 6 of the shoe cover 2 are symmetrically positioned with respect to the upright 15 of the frame 5 so that with a single lever 23 fixed to such an upright it is advantageously possible to simultaneously move in a balanced way both the frameworks 6.

Preferably, the supporting frame 5 is also provided at an upper end with a tray 28 for receiving the shoe covers 2 to be worn, which can thus be advantageously accumulated in the amount required for a prompt use of the same.

From what has been outlined above the operation of this preferred embodiment of the applicator apparatus 1 according to invention is immediately clear.

In an upper application position of the shoe covers 2 on the corresponding supporting frameworks 6, illustrated in figure 2 and which may be reached by rotating the lever 23 upwards, the user or specific trained personnel is easily capable – standing advantageously in an upright position – of peripherally applying each shoe cover 2 onto each framework 6 by suitably widening the opening 3 in contrast to the elastic band 4 and by arranging the shoe cover 2 on the branches 7, 8.

This operation, in the illustrated embodiment, also foresees a thrusting action on the branches 7, 8 to overcome the opposition of the spring means 13, 14 which tend to keep the branches 7, 8 in the spaced apart condition.

If the elastic band 4 is absent, on the other hand, the application operation foresees just the aforementioned thrusting action on the branches 7, 8 to overcome the opposition of the spring means 13, 14.

Advantageously, the application operation of the shoe covers 2 is facilitated by the radially outer edge 12 of the branches 7, 8 of each framework 6, said edge also cooperating to effectively hold in position each shoe cover 2.

Advantageously, each framework 6 is also capable of effectively holding in position each shoe cover 2 and each insertion opening 3 thereof in a widened condition thanks to the spacing apart action of the spring means 13, 14 active on the branches 7, 8 to urge them apart.

Once each of the shoe covers 2 has been applied onto the relative supporting frameworks 6, the user or the specific trained personnel can easily move the frameworks 6 to the lower release position of the shoe cover 2, illustrated in figure 1, by simply rotating the lever 23 of the displacing device 22 downwards.

Advantageously, the downward movement of the frameworks 6 takes place with a minimum effort and in a balanced way thanks to the presence of the counterweights 21 and thanks to the symmetrical arrangement of the frameworks 6 with respect to the upright 15 of the frame 5.

Once the release position has been reached, the user can wear each shoe cover 2 on his own footwear by simply inserting his foot into the insertion opening 3, advantageously held in a widened condition by the ring-shaped configuration of the frameworks 6 and by the action of the spring means 13, 14, and then pushing downwards the foot so as to take off the shoe covers 2 from the frameworks 6.

As soon as each shoe cover 2 has been worn, the spring means 13, 14 move once again the branches 7, 8 of the framework 6 into the spaced apart condition, said framework 6 being then ready to support a new shoe cover 2 once again.

The applicator apparatus 1 described above thus allows a shoe cover to be applied and worn easily, totally within the ability of the elderly, the sick people or pregnant women, and with a minimum manual intervention by the user or by possible trained personnel.

If desired and as outlined above, the manual intervention of the user can even be eliminated if the application operations of the shoe covers 2 and the moving operations of the lever 23 are carried out by trained personnel, for example a nurse in the case of hospitals.

With reference to figures 3-16 additional preferred embodiments of the applicator apparatus 1 according to the invention will now be described.

In the rest of the description and in such figures, the elements of the applicator apparatus 1 that are structurally or functionally equivalent to those previously illustrated with reference to figures 1 and 2 will be indicated with the same reference numerals and will not be described any further.

In the embodiment illustrated in figure 3, the applicator apparatus 1 achieves substantially the same technical effects and the same advantages as the previous embodiment with a partially different structure of the supporting frameworks 6 of the shoe cover 2.

In this case, such a structure is again of the fork type but comprises a fixed branch 8 and a branch 7 movable with respect to the same, so as to ensure the desired holding action of the shoe cover 2 with the opening 3 in a widened condition to facilitate the insertion of the user's foot.

In this alternative preferred embodiment, the applicator apparatus 1 further comprises at least one driving rod 29 extending between the transversal supporting rod 17 and the movable branch 7 of the framework 6.

Preferably, the driving rod 29 is provided at its opposite ends with respective spring means 30, 31, arranged between the driving rod 29 and the block 27 and, respectively, between the driving rod 29 and the movable branch 7 of the framework 6.

Advantageously, the driving rod 29 is capable of moving the movable branch 7 towards the fixed branch 8 of the supporting framework 6 at the application position of the shoe cover 2 on the framework 6, thus facilitating the application operations that, in this case, foresee just a thrusting action on the branch 7 to overcome the opposition of the spring means 31.

Advantageously, the spring means 30 contribute – together with the ring-shaped configuration of the framework 6 – to hold in a widened condition the insertion opening 3 of the shoe cover 2 in the lower release position, substantially according to the same operations outlined with reference to the previous embodiment.

In the preferred embodiments illustrated in figures 4-16, the applicator apparatus 1 substantially achieves the same technical effects and the same advantages as the previous embodiment with a mechanical construction and a cooperation of elements suitable for the storage, movement and release of a plurality of shoe covers 2 peripherally applied on a corresponding plurality of pairs of frameworks 6.

Advantageously, this embodiment allows the storage, movement and release of a quantity of shoe covers 2 sufficient to satisfy the requirements of a sterile or "clean" area for a predetermined period of time, for example one shift or one working day.

In this embodiment, the supporting frame 5 comprises a pair of uprights 15 provided at the lower end with respective bases 32 which ensure that the frame 5 is securely rested on the floor.

In a way conventional *per se*, the frame 5 supports a protective casing, schematically indicated at 33 in figure 4, adapted to encase both the frameworks 6 and the devices for moving the same which will be described in greater detail hereinafter.

In this preferred embodiment, the applicator apparatus 1 comprises a plurality of supporting frameworks 6 of the shoe cover 2, preferably moved in pairs and associated to a conveyer device 34 of the frameworks forming part of the displacing device 22 and adapted to transport the frameworks from the application position towards the release position of the shoe covers 2.

Preferably, the pairs of supporting frameworks 6 of the shoe cover 2 are pitchwise

spaced apart from each other along the conveyer device 34 so as to have a regular distribution of the frameworks 6 and of the shoe covers 2 applied thereon within the useful storage space defined in the protective casing 33 of the applicator apparatus 1.

Preferably, moreover, each of the supporting frameworks 6 of the shoe cover 2 is associated to a respective transversal supporting rod 17 of a plurality of rods extending substantially perpendicular to the uprights 15.

In this preferred embodiment, the transversal supporting rods 17 are also pitchwise spaced apart from each other along the conveyer device 34, which is also preferably advantageously capable of moving the frameworks 6 pitchwise towards the lower release position of the shoe cover 2.

In the preferred embodiment illustrated in figure 4, the lower release position of the shoe cover 2 is advantageously defined at an opening 35 of the protective casing 33.

Preferably, the supporting frameworks 6 of each pair are associated to their own transversal supporting rod 17 in a symmetrical way and at axially opposite sides of the rod itself so as to have a balanced movement.

Preferably, the supporting framework 6 of each pair is rotatably mounted on the conveyer device 34 by means of a connection arm 16 hinged to the conveyer device 34 and, more specifically, to the transversal supporting rod 17, about a hinging axis B-B substantially perpendicular to the uprights 15 (see figure 5).

In this way, it is advantageously possible to suitably reduce the space occupied by the frameworks 6 within the protective casing 33 achieving an advantageous reduction of the depth of the applicator apparatus 1.

Preferably, the supporting framework 6 of each pair is in turn rotatably articulated to the connection arm 16 about a hinging axis Z-Z substantially perpendicular to the arm 16 itself (see figure 5).

In this way, it is advantageously possible to further reduce the space occupied by the frameworks 6 within the protective casing 33 achieving a further reduction of the depth of the applicator apparatus 1.

Preferably, the conveyer device 34 of the frameworks 6 comprises at least one and preferably two moving and supporting elements of the frameworks 6.

In the preferred embodiment illustrated in figures 4-7, these moving and supporting

elements of the frameworks 6 are of the flexible type and consist of two closed chains 37, 38 provided with a front branch 37a, 38a and with a rear branch 37b, 38b.

Preferably, the transversal supporting rods 17 extend between the two moving and supporting elements of the frameworks 6 (the chains 37, 38 in this case) of the conveyer device 34 and, as stated, are preferably pitchwise spaced apart from each other.

Preferably, the conveyer device 34 comprises guide means adapted to keep the front branches 37a, 38a of the chains 37, 38 in a substantially vertical direction.

Advantageously, this guide means allows to avoid a possible bending of the chains 37 and 38 due to the weight force applied by the frameworks 6 and by the connection arms 16 on the chains themselves, which bending could block or compromise the regular movement of the chains 37, 38.

In the illustrated embodiment, this guide means consists, for example, of two vertical bars 36 extending substantially parallel to the uprights 15 and supported in a way conventional *per se* by the frame 5 close to an inner face of the front branches 37a, 38a of the chains 37, 38 (see figure 5).

In the preferred embodiment illustrated in figures 4-8, the conveyer device 34 comprises:

i) at least a first pair of coaxial upper gear wheels 39, 40, rotatably supported by the supporting frame 5 along a first hinging axis I-I transversely extending with respect to the uprights 15 at an upper end of the frame 5;

ii) at least a second pair of coaxial lower gear wheels 41, 42, rotatably supported by the supporting frame 5 along a second hinging axis I'-I' transversely extending with respect to the uprights 15 at a lower end of the frame 5;

and

iii) a pair of flexible moving and supporting elements of the frameworks 6 each element being adapted to engage a respective gear wheel of said first and said second pair of upper wheels 39, 40 and lower wheels 41, 42.

In this preferred configuration of the conveyer device 34, wherein the flexible moving and supporting elements of the frameworks 6 are constituted by the chains 37, 38, there is a meshed engagement of the latter with the gear wheels 39, 41 and, respectively, 40, 42 of said first and second pair of wheels.

Preferably, the upper gear wheels 39, 40 and the lower gear wheels 41, 42 of the conveyer device 34 are keyed on respective supporting shafts respectively indicated in figures 4-8 with reference numerals 43 and 44. The shafts 43 and 44 are in turn rotatably supported in an idle manner by the frame 5.

In the preferred embodiment illustrated in figures 4-8, the conveyer device 34 of the frameworks 6 comprises at least one actuator 56 adapted to move the frameworks 6 from the application position towards the release position of the shoe covers 2.

Preferably, the actuator 56 of the conveyer device 34 of the frameworks 6 comprises a pair of operating levers, a front lever 45 and, respectively a rear lever 46, connected together and accessible at opposite sides of the supporting frame 5.

Preferably, the front lever 45 is substantially C-shaped and is rotatably articulated to the frame 5 at the opposite ends of said C about a hinging axis L-L extending substantially perpendicular to the uprights 15 (see figure 7).

In this way, the front lever 45 is advantageously provided with a substantially rod-shaped handle that eases the maneuvering operations of the conveyer device 34 of the frameworks 6.

Advantageously, both the levers 45, 46 are active on each of the transversal supporting rods 17 by means of a ratchet device generally indicated at 47.

Preferably, the ratchet device 47 is provided with a pawl 48 and with spring means 49 adapted to urge the pawl 48 towards each of the transversal supporting rods 17 (see figure 7).

Preferably, the conveyer device 34 of the frameworks 6 is also provided with spring means 57 active on the operating levers 45, 46 to hold them at a rest position in which the ratchet device 47 is engaged with one of the transversal supporting rod 17 (see figure 7).

Preferably, the applicator apparatus 1 further comprises in this embodiment stop means 50, 51 adapted to limit the angular displacement of the levers 45, 46 of the conveyer device 34 of the frameworks 6 in contrast respectively to the spring means 57 and to the thrusting action applied by the user.

Thanks to this configuration, it is also advantageously possible to adjust the angular displacement of the levers 45, 46 allowed by the stop means 50, 51 so as to have the

desired correct pitchwise advancing motion of the supporting frameworks 6 actuated by the conveyer device 34.

Preferably, the applicator apparatus 1 further comprises guide means 52 adapted to hold in a raised condition each framework 6 of said plurality of frameworks upstream of the release position of the shoe cover 2.

In this way and thanks to the rotatable articulation of the connection arms 16 to the transversal supporting rods 17, it is advantageously possible to hold in a "stacked" condition a plurality of frameworks 6 in the front area of the applicator apparatus 1 occupying a relatively small space and reducing the depth of the apparatus itself.

Preferably, the guide means 52 comprises a rail 53 supported in a way known *per se* by the supporting frame 5 and extending along a direction substantially parallel to the uprights 15.

Preferably, the rail 53 is provided with a sliding track 54 adapted to cooperate in abutment relationship with a transversal rod 55 laterally fixed to the connection arms 16 of the frameworks 6 forming part of each pair.

In the embodiment illustrated in figures 4-8, each transversal rod 55 is advantageously fixed to the connection arms 16 at their axially opposite ends.

Preferably, the rail 53 is provided with a substantially hook-shaped lower portion 53a to allow an angular displacement of predetermined value of each of the frameworks 6 towards the release position of the shoe covers 2.

In this way, the rail 53 is advantageously capable of holding the frameworks 6 in the aforementioned "stacked" condition upstream of the release position of the shoe covers 2 and of allowing a rotation of the frameworks 6 towards the front part of the applicator apparatus 1, with a simultaneous outward movement of the insertion opening 3 of a user's footwear, immediately upstream of the release position (see figure 5).

Preferably, the rail 53 is provided with a stop plate 58 fixed to the substantially hook-shaped lower portion 53a and adapted to cooperate in abutment relationship with the transversal rod 55 to hold the supporting frameworks 6 at the release position of the shoe covers 2.

Advantageously, the stop plate 58 allows to correctly arrange the transversal rod 55 cooperating in abutment relationship therewith at the release position of the shoe covers

2.

Preferably, the stop plate 58 is coated on top with an anti-friction material, so as to suitably reduce the force required to get past the abutment defined by the plate itself.

In the embodiment illustrated in figures 4-8, the protective casing 33 is provided with a removable cover 59 for accessing the supporting frameworks 6 of the shoe covers 2 in the upper application position illustrated in greater detail in figure 6.

In this way, it is advantageously possible to easily carry out the application operations of the shoe covers 2 on the supporting frameworks 6 as will become clearer hereinafter.

From what has been outlined above the operation of this further preferred embodiment of the applicator apparatus 1 according to the invention is immediately clear.

In an upper application position of the shoe cover 2 on the corresponding supporting frameworks 6, illustrated in figure 6 and accessible by removing the cover 59 from its seat, personnel responsible for loading the shoe covers 2 are easily capable – standing advantageously in an upright position – of peripherally applying each shoe cover 2 onto each framework 6 by suitably widening the opening 3 in contrast to the elastic band 4 and arranging the shoe cover 2 on the branches 7, 8.

This operation can also foresee a thrusting action on the branches 7, 8 to overcome the opposition of possible spring means 13, 14 (not illustrated in detail for the sake of simplicity) or the opposition exerted by the elasticity of the material which the branches 7, 8 are made of, which elements tend to keep the branches 7, 8 in a spaced apart condition.

On the other hand, if the elastic band 4 is absent, the application operation foresees just the aforementioned thrusting action on the branches 7, 8 to overcome the opposition of the spring means 13, 14.

Advantageously, the application operation of the shoe cover 2 is facilitated by the radially outer edge 12 of the branches 7, 8 of each framework 6, edge which also cooperates to effectively hold each shoe cover 2 in position.

Advantageously, each framework 6 is also capable of effectively holding each shoe cover 2 in position and each insertion opening 3 thereof in a widened condition thanks to the spacing apart action of the spring means 13, 14 active on the branches 7, 8 to urge them apart.

Once a pair of shoe covers 2 has been applied on a corresponding pair of supporting frameworks 6, the personnel can easily actuate the conveyer device 34 by acting on the lever 46 of the actuator 56 so as to advance stepwise the chains 37, 38, thanks to the action of the ratchet device 47, in contrast to the action of the spring means 57.

Advantageously, the stop means 50 and 51 determine the maximum angular displacement allowed to the lever 46, whereas the spring means 49 and 57 ensure a correct operation and a correct repositioning of the actuator 56 and of the ratchet device 47 forming part of the same.

In this way, a new pair of empty supporting frameworks 6 is conveyed to the application position of the shoe covers 2 illustrated in figure 6.

Advantageously, the supporting frameworks 6 are arranged in a substantially horizontal position which facilitates the application of the shoe covers 2 thanks to a suitable design of the connection arms 16 and of the pitch between the frameworks 6 rotatably articulated to the arms themselves.

The application of the shoe covers 2 on all of the supporting frameworks 6 can easily be carried out by cyclically repeating these operations.

At this point, the applicator apparatus 1 is ready for use with an autonomy of use that can be determined in advance and capable to satisfy the average requirements of use of the shoe covers 2 for a predetermined time period, for example one day or one workshift.

The user can move the frameworks 6 to the lower release position of the shoe cover 2, illustrated in figure 5, by simply rotating the lever 45 of the actuator 56 downwards which lever causes a displacement of the frameworks 6 exactly as previously illustrated in relation to the application operations of the shoe covers 2.

Advantageously, the downward movement of the pairs of frameworks 6 takes place with a minimum effort and in a balanced way thanks to the symmetrical arrangement of the frameworks 6 along the conveyer device 34 and, in general, thanks to the fact that substantially all of the elements of the applicator apparatus 1 are symmetrically arranged with respect to the longitudinal middle plane of the apparatus 1.

As already outlined, the rail 53 allows to hold the frameworks 6 in a stacked condition requiring a minimum amount of space and therefore allows a rotation of the frameworks towards the front part of the applicator apparatus 1 immediately upstream of the release

position, as illustrated in figure 5.

Once the release position has been reached, the user can put each shoe cover 2 on his footwear by simply inserting his foot into the insertion opening 3 and then pushing his foot downwards so as to take off the shoe cover 2 from the frameworks 6.

Advantageously, the insertion opening 3 is held in a widened condition by the ring-shaped configuration of the frameworks 6 and possibly thanks to the action of the spring means 13, 14 if present or, furthermore, thanks to the elastic characteristics of the material which makes the branches 7 and 8 of the fork-shaped frameworks 6.

Advantageously, the presence of the stop plate 58 holds the frameworks 6 at the release position avoiding their accidental displacement once a single shoe cover 2 has been worn.

As soon as each shoe cover 2 has been worn, the spring means 13, 14 urge once again the branches 7, 8 of the framework 6 into the spaced apart condition, said framework 6 being then ready to support a new shoe cover 2 once again.

A new user can then move a new pair of frameworks 6 provided with shoe covers 2 to the lower release position by simply rotating the lever 45 of the actuator 56 downwards just in the same way illustrated above.

Also in this case, the action of the spring means 49 and 57 is exerted in the same identical way illustrated with reference to the application operations of the shoe covers 2.

The applicator apparatus 1 described above thus allows a shoe cover 2 to be easily applied and worn, totally within the capabilities of the elderly, the sick people or pregnant women, and with a minimum manual intervention by the user.

Also in this case, the manual intervention of the user can even be eliminated if the moving operations of the lever 45 are carried out by trained personnel, for example a nurse in the case of a hospital.

In the embodiment illustrated in figure 8, the applicator apparatus 1 achieves substantially the same technical effects and the same advantages as the previous embodiment with a partially different structure of the conveyer device 34 of the frameworks 6.

In this case, in fact, the supporting frameworks 6 of the shoe covers 2 are rotatably

mounted directly on the conveyer device 34 and in particular preferably directly mounted on the transversal supporting rods 17 in an idle manner without interposition of the connection arms 16. Preferably, the frameworks 6 are rotatably mounted idly on the transversal supporting rods 17 by means of respective perforated blocks 88 and possibly provided with suitable means adapted to facilitate a free rotation of the frameworks 6 (see figure 8).

Advantageously, this alternative embodiment allows to further reduce the depth of the applicator apparatus 1 if needed by the requirements of use.

In the preferred embodiment illustrated in figure 8, the conveyer device 34 of the frameworks 6 comprises at least one and preferably two closed toothed belts 62, 63 provided with a front branch 62a, 63a and with a rear branch 62b, 63b.

In the same way as the previous embodiment, the transversal supporting rods 17 extend also in this case between the toothed belts 62, 63 of the conveyer device 34 and are preferably pitchwise spaced apart from each other.

In this case, the conveyer device 34 comprises a third pair of gear wheels 60, 61 coaxially mounted on the frame 5 along a hinging axis parallel to, or substantially coinciding with, the longitudinal axis of the transversal supporting rod 17 arranged at the release position of the shoe cover, as illustrated in figure 8.

The conveyer device 34 further comprises, in order to allow a correct movement of the toothed belts 62, 63, a pair of tension rollers 64, 65 adapted to press the toothed belts 62, 63 towards the lower gear wheels 41, 42 of the conveyer device 34.

Preferably, the gear wheels 60, 61 and the tension rollers 64, 65 are supported in a cantilevered fashion by the frame 5 by means of respective support arms generally indicated at 66a-66d.

Clearly, the gear wheels 39-42 and 60, 61 will have a structure and in this case will be made of materials adapted to allow a correct cooperation with the toothed belts 62, 63, whereas the guide means 52 adapted to hold each supporting framework 6 in raised condition upstream of the release position of the shoe cover 2 will be suitably shaped to take into account the different configuration of the conveyer device 34 and of the front part of the applicator apparatus 1.

The operation of this further preferred embodiment of the applicator apparatus 1 according to the invention is totally similar to that described with reference to the

previous embodiment for which reason it will not be repeated here.

In the preferred embodiment illustrated in figures 9 and 10, the applicator apparatus 1 of the invention further comprises at least one raising device, preferably a pair of raising devices generally indicated at reference numeral 67, adapted to engage the supporting frameworks 6 of the shoe covers 2 when they are arranged at the upper application position of the shoe covers themselves.

Preferably, the raising devices 67 are rotatably mounted on respective supporting arms 75 extending in a cantilevered fashion from the uprights 15 of the frame 5.

Preferably, the raising devices 67 comprise a suitably shaped lever 68, rotatably supported by the arm 75, said lever being provided with two portions 68a, 68b forming an obtuse angle of predetermined value therebetween.

The portion 68a is provided with a free end adapted to engage the outer branch 7, 8 of the supporting framework 6 of the shoe covers 2, which outer branch can be provided with the spring means 13, 14.

The portion 68b, on the other hand, is provided in turn at one end with a knob 77 adapted to facilitate the operating of the lever 68 by a user or by personnel responsible for loading the shoe covers 2.

Advantageously, the framework 6 is raised by rotating the lever 68 and thanks to a suitable configuration of parts of the free end of the portion 68a.

To this end, the free end of the portion 68a of the lever 68 is provided with a roller 69 equipped with a groove 84, adapted to cooperate with one of the radially outer edges 12 (in this case the upper one) of the branches 7, 8 of the supporting framework 6.

Preferably, the grooved roller 69 is fixed to a block 76 which is in turn fixed to the portion 68a so as to form an angle of predetermined value with respect to the longitudinal axis of such a portion. In other words, the roller 69 is skew with respect to a vertical plane passing through the longitudinal axis of the portion 68a. In this way, the roller 69 raises the framework 6 during rotation of the lever 68 thanks to its cooperation with the upper edge 12 thereof (in this case facing downwards since the frameworks 6 are upside-down with respect to their normal position of use during the application operations of the shoe covers 2), said edge 12 being pushed upwards by the roller 69 during its sliding inside the groove 84.

Preferably, the raising devices 67 comprise respective spring means 78 active on the levers 68 to hold them at a rest position in which the roller 69 is in abutment with the supporting arm 75 (see figure 10).

Preferably, the raising devices 67 further comprise in this embodiment stop means 79, for example consisting of a pin extending from a disc 80 forming part of the levers 68 and hinged to the arms 75 about a substantially vertical hinging axis V-V.

Advantageously, the stop means 79 limit the angular displacement of the levers 68 of the raising devices 67 of the frameworks 6 during the operation of the levers 68 in contrast to the spring means 78, thanks to their cooperation in abutment relationship with the arms 75.

Thanks to this configuration, it is also advantageously possible to adjust the angular displacement of the levers 68 allowed by the stop means 79 by suitably positioning the pin on the disc 80.

Advantageously, the raising devices 67 further facilitate the application operations of the shoe covers 2 on the supporting frameworks 6 thanks to a double action which is carried out by rotating the lever 68 about the hinging axis V-V:

1) a lifting action of the frameworks 6 thanks to the cooperation between the roller 69 and the upper edge 12 of the frameworks 6 during the rotation of the lever 68; in this way and as illustrated in figure 9, it is possible to move one of the two frameworks 6 away from the other one and to easily apply the shoe cover 2 on the lower edge 12 (in this case facing upwards since the frameworks 6 are upside-down during the application operations of the shoe covers 2 with respect to their normal position of use); and

2) a thrusting action on the outer branch 7, 8 of the frameworks 6 to overcome the opposition of possible spring means 13, 14 (not illustrated in detail for the sake of simplicity) or the opposition developed by the elasticity of the material which the branches 7, 8 are made of, so as to further facilitate the application operations of the shoe covers on the frameworks 6.

In the preferred embodiment illustrated in figures 11-16, the applicator apparatus 1 of the invention achieves the maximum size reduction in the depth direction thanks to an additional series of features described hereafter.

A first feature is that the supporting frameworks 6 of the shoe covers 2 are directly

hinged on the transversal supporting rods 17.

A second feature is constituted by a simplification of the guide means 52 adapted to hold each framework 6 of said plurality of frameworks in a raised condition upstream of the release position of the shoe cover 2.

In this case, such guide means comprises a substantially fixed front wall 33a of the protective casing 33 and a tilting door 70 rotatably supported by the frame 5 at the lower release position of the shoe cover 2.

Advantageously, the door 70 takes up a folded back position inclined towards the inside of the frame 5 so as to facilitate the wearing operations as much as possible in the "apparatus ready" condition illustrated in figures 11-13, i.e. when the frameworks 6 are in the lower release position of the shoe cover 2.

Preferably, the frame 5 comprises in this case two pairs of uprights 15 fixed to the opposite ends of the bases 32 (see figure 11). In this embodiment, moreover, the frame 5 is advantageously provided with two pairs of wheels 85 which allow an easy movement thereof.

In this preferred embodiment, the applicator apparatus 1 of the invention further comprises at least one driving device 71 of the tilting door 70 adapted to lift such a door 70 when the conveyer device 34 of the supporting frameworks 6 is operated so as to allow the positioning of a pair of frameworks 6 at the lower release position of the shoe covers 2. Advantageously, the driving device 71 is also adapted to take the tilting door 70 back into the folded back position inclined towards the inside of the frame 5.

Preferably, the driving device 71 comprises a suitably shaped operating lever 72 rotated by the conveyer device 34 (figures 12-14).

To this end, the lever 72 comprises an elongated body 81 rotatably mounted on the front upright 15 of the frame 5 about a substantially horizontal hinging axis I''-I''.

The lever 72 is provided with a driving rod 73 associated to an inner end 81a of the elongated body 81 and kinematically connected to the tilting door 70 so as to lift the door 70 when the conveyer device 34 is operated.

The lever 72 is also provided with a substantially L-shaped end piece 82 extending in a cantilevered fashion from the elongated body 81 and adapted to cooperate in abutment relationship with the transversal supporting rods 17 whenever the conveyer device 34 of

the supporting frameworks 6 is operated.

The driving device 71 also comprises spring means 74 active on the operating lever 72 to lower the door 70 when the supporting framework 6 is in the lower release position of the shoe cover 2.

In the preferred embodiment illustrated, the spring means 74 consist of a helical spring extending between an outer end 81b of the elongated body 81 and a pin 86 extending from an L-shaped plate 87 fixed to the front upright 15 of the frame 5. This helical spring is active on the end 81b of the elongated body 81 of the lever 72 to move such an end downwards.

Advantageously, the driving rod 73 of the lever 72 is kinematically connected to the door 70 by means of a shaped block 83 to which the door 70 is fixed, preferably in a removable manner, by means of means known *per se*, such as for example screws.

Thanks to this configuration of parts, the applicator apparatus 1 achieves the maximum depth reduction since it is provided with a wearing space of the shoe cover 2 which extends in part within the outer outline of the frame 5 (see figures 11-13 and 16).

This takes place thanks to the fact that the door 70 is held in a folded back position towards the inside by the spring means 74 acting on the lever 72.

In this way, the user can easy gain access to the wearing position and put on the shoe covers 2.

During the positioning of a new pair of frameworks 6 in the lower release position of the shoe covers, the conveyer device 34 operates the driving device 71 of the door 70 thanks to the thrust applied by the transversal supporting rod 17 on the free end of the substantially L-shaped end piece 82 of the lever 72, said end piece 82 being urged downwards thus causing a rotation of the lever 72 about its hinging axis I''-I'' as better illustrated in figures 14 and 15.

This rotation of the lever 72, which takes place in contrast to the spring means 74, lifts the driving rod 73 which lifts in turn the door 70 that can thus release a new pair of frameworks 6 which are thus allowed to rotate towards the lower release position under the action of their own weight as soon as the transversal supporting rod 17 goes past the free end of the end piece 82.

Advantageously, the positioning of the frameworks 6 takes place "automatically" by

exploiting their weight force since they are idly hinged on the transversal supporting rods 17.

Advantageously, the frameworks 6 ready to be worn are held in the release position thanks to the abutment of the blocks 88 with the corresponding blocks of the pair of frameworks 6 lying immediately upstream (see figure 12).

When the thrusting action of the conveyer device 34 stops, the lever 72 of the driving device 71 goes back into its original position thanks to the action of the spring means 74 which bring back the door 70 to the folded back position inclined towards the inside of the frame 5.

In the preferred embodiments described above with reference to figures 4-16, the application and release positions of the shoe cover 2 and the relative planes defined by the frameworks 6, are angularly offset from each other of an angle α that can vary between 200° and 290°.

More particularly, the application position of the shoe cover 2 illustrated in figures 6 and 9 can form an angle $\alpha 1$ with respect to a horizontal plane that can vary between 0° and 30°, whereas the release position of the shoe cover 2 illustrated in figures 4, 5, 8, 11, 15 and 16 can form an angle $\alpha 2$ with respect to a horizontal plane that can vary between 20° and 60°.

It also derives from this that in the various preferred embodiments of the invention illustrated with reference to figures 1-16, the application and release positions of the shoe cover 2 and the relative planes defined by the frameworks 6 can be angularly offset from each other of an angle that can vary between 60° and 290°.

Clearly, a man skilled in the art can bring modifications and variants to the invention described above, in order to satisfy contingent and specific application requirements, which variants and modifications are in any case all covered by the scope of protection as defined by the following claims.

Thus, for example, the conveyer device of the supporting frameworks can comprise conveying elements of the frameworks different from the chains, belts and/or gear wheels illustrated purely as an example, such as for example bands cooperating with pulleys and on which the frameworks are associated.

In the same way, the actuator of the conveyer device of the supporting frameworks can comprise motorized means active on the transporting elements and/or on the elements

for the transmission of motion instead of being of the manual type. In this case, it is also advantageously possible to provide the applicator apparatus of the invention with a suitable control station, conventional *per se*, adapted to control the moving operations of the supporting frameworks.

Finally, the applicator apparatus 1 can be provided with conventional means adapted to indicate that the shoe covers 2 have run out so as to call for the intervention of personnel responsible for reloading the shoe covers themselves.